

## Reconfigurable Weather Radar for Airborne Applications, Phase I

Completed Technology Project (2009 - 2010)



## Project Introduction

Intelligent Automation, Inc (IAI) and its university partner, University of Oklahoma (OU), Norman, propose a forward-looking airborne environment sensor based on active weather radar technologies. The sensor consists of a software-defined radar transceiver, compact dual-polarized array antenna operating in the X-band as well as an integrated RF analog front-end. By leveraging dual-polarization processing, the system will be able to extract atmospheric parameters; thus it will be able to identify and classify the atmospheric conditions as well as local obscurants. The software defined radar transceiver has a Direct Digital Synthesis (DDS) component which can easily generate high bandwidth chirp waveforms (bandwidth  $\geq 200$  MHz) and pulse shaping can be defined digitally to reduce the side-lobes considerably. IAI is currently developing a software defined radar (SDR) platform that can adaptively switch between different modes of operation for radar, by modifying both transmit waveforms and receive signal-processing tasks on the fly. The proposed multi-channel radar technique and the system design will leverage IAI's vast experience in SDR, RF hardware design and antenna design and OU's capabilities in microwave design and field-proven atmospheric hazard modeling and detection algorithm development.

## Anticipated Benefits

The most promising Non- NASA commercial applications are: Arbitrary wideband waveform synthesizer Reconfigurable radar transceiver with multi-mode capabilities Commercial aircraft collision avoidance and safety High speed digital waveform reader UAV based applications (due to the small form factor and low power). This would include UAV based weather surveillance, target tracking and other commonly sought after UAV radar applications IAI has tremendous experience of designing customized radar assembly and packaging them as field-ready units. Again, if technically the project is successful, we will approach large, established companies in this market segment with the goal of licensing our technology and possible collaboration for Phase II efforts. The proposed technology is built upon the radar design and communications expertise of IAI and our sub-contractors at OU. The most promising commercial applications of interest to NASA are: Weather surveillance Earth science measurements Reconfigurable radar IAI has a long history of successfully designing custom radars for NASA, and most NASA applications could be supported by our reconfigurable radar design.



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## Table of Contents

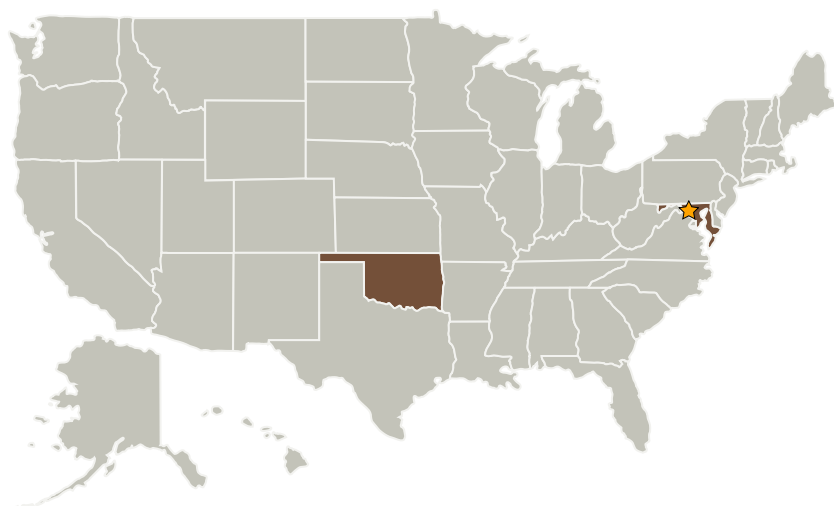
Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Intelligent Automation, Inc.	Supporting Organization	Industry	Rockville, Maryland
University of Oklahoma-Norman Campus	Supporting Organization	Academia	Norman, Oklahoma

## Primary U.S. Work Locations

Maryland	Oklahoma
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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Project Manager:**

Gerald M Heymsfield

**Principal Investigators:**Arvind Bhat  
Coorg Prasad

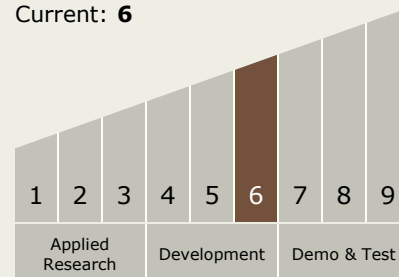
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## Technology Maturity (TRL)

Start: 6  
Current: 6



## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves